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The Influence of School Type on Students' Attitudes towards Mathematics in Quetta, Pakistan

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The purpose of this study was to find out the influence of school type on students' attitudes towards mathematics at the secondary level in Quetta, Pakistan. The sample in this study was 387 students of grade nine of which 186 were government and 201 were private secondary school students selected through stratified random sampling. Data were collected through an adapted questionnaire and students were asked to indicate their degree of agreement with each statement in the questionnaire, from 'strongly disagree' to 'strongly agree'. Non-parametric equivalent of the independent t-test was used for statistical analysis. According to the results of the analysis, overall students, irrespective of government and private schooling systems, indicated highly positive attitudes towards mathematics. Findings also revealed that students from the private schools showed a slightly high degree of confidence in learning mathematics as compared to students from the government schools. Some recommendations have been put forward for policy and practice in the light of the research study findings.

Keywords: *attitude, mathematics, school type, secondary school*

Introduction

The purpose of this study was to find out the influence of school type on students' attitudes towards mathematics at the secondary level in Quetta, Pakistan. Unlike most developed and developing countries, a complex structure of education functions in Pakistan with a variety of educational systems such as government, private, and *madrassa.* Government schools provide education to a large segment of the population. Children educated in government schools belong mainly to a poor segment of the society. They have lesser opportunities for quality education. There is no doubt that the quality of education in government schools in Pakistan is questionable. A large majority of the schools in the government sector do not have the essential amenities. The same situation prevails with the teaching and learning processes in classrooms. The government schools are fully dependent on the state exchequer. These schools offer primary education from grade one to five, middle education from grade six to eight, and then secondary education from grade nine and ten. The medium of instruction in government schools is Urdu (the National Language of Pakistan). Majority of the government schools (primary, middle, and secondary) in Pakistan are single-sex schools. On the other hand, the private schooling system also caters to education for the medium and high socio-economic segments of the society. Private schools generate their own income by charging students from low to high fees. The medium of instruction in private schools is largely English but in some cases these schools are bilingual (both Urdu and English). The other system that functions in Pakistan in general and Quetta in particular is the *madrassa* system of education which is primarily providing religious education. However, in some *madrassas* liberal education is offered to the children of the society.

There is a general consensus among researchers and educationists that attitudes towards mathematics are vital in the achievement and participation of students in mathematics. However, students' low achievement in mathematics is the major concern of the developing world in general and Pakistan in particular. One of the key factors that greatly influences students' achievement in mathematics is

students' attitude towards the discipline. Moreover, attitude towards mathematics is also influenced by many factors such as gender, parents, peers, teachers, teaching methods, ethnicity, the home and the type of schooling. However, the focus of this study is to investigate the influence of school type on students' attitudes towards mathematics.

Several research studies have been conducted in the developed and developing countries on the influence of school type on students' attitudes towards mathematics. For instance, Miller and Moore (1991) found that students from private schools showed significantly more positive attitudes towards mathematics than students from government schools. In contrast, Utsumi and Mendes (2000) found that students from government schools reported to have more positive attitudes towards mathematics than students from private schools. As noted, the findings of both the studies revealed inconsistent results.

Furthermore, several research studies have also been conducted in Pakistan on students' attitudes towards mathematics at the secondary level and the studies primarily focussed on the effect of gender (e.g. Amirali, 2010; Chauhan & Bhutta, 2010; Farooq & Shah, 2008), and grade level (e.g. Chauhan & Bhutta, 2010). None of the above studies looked at the influence of school type on students' attitudes towards mathematics at the secondary level. Hence, there was a need to find out the influence of school type on students' attitudes towards mathematics at the secondary level in Quetta, Pakistan.

There have been several research studies conducted in Pakistan on the relative effectiveness of government and private schools. For instance, Alderman, Orazem and Paterno (2001) found evidence of higher mathematics and language achievements of students in private schools than in government schools in Pakistan. Another study by Arif and Saqib (2003) also found that private school students performed significantly better than those in government schools on tests of numeracy, literacy and general knowledge. Moreover, a study conducted by Das, Pandey, and Zajonc (2006) found that private school students outperformed government school students in all three subjects (English, Urdu, and Mathematics). A more recent study by Aslam (2009) found that private school students achieved a higher score on standardized tests of literacy and mathematics as compared to government school students, and the difference was statistically significant. The results of this study also confirm the results of the previously-mentioned studies. However, it is important to note that there is a dearth of literature in Pakistan that has explored the influence of school type on students' attitudes towards mathematics.

Based on a review of the literature, therefore, this has been the first study that has explored the influence of school type on students' attitudes towards mathematics at the secondary level in the context of Quetta, the provincial capital of Balochistan province, Pakistan. Attitude towards mathematics in this study refers to one's feelings and emotions towards mathematics that includes self-confidence, value, enjoyment, and motivation (Tapia, 1996; Tapia & Marsh II, 2004).

Methodology

A cross-sectional survey design was employed to find out the influence of school type on students' attitudes towards mathematics at the secondary level in Quetta, Pakistan using a questionnaire. Surveys are "… extremely efficient at providing large amounts of data, at relatively low cost, in a short period of time" (Robson, 2002, p.234). More specifically, a cross-sectional survey design served the purpose of this study which was to collect data in order to find out the attitudes of research participants at a single point in time (Fraenkel & Wallen, 2006; Robson, 2002).

Sample and Sampling Procedure

The target population in this study was all government and private secondary schools functioning in Quetta, Pakistan. The sample in this study comprised (n = 387) students of ninth grade of which 186 were government and 201 were private secondary school students selected through stratified random sampling from six government and six private secondary schools.

Data Collection Tool

A standardized questionnaire was adapted called 'Attitudes Toward[s] Mathematics Inventory'

(ATMI) which was constructed by Tapia (1996) and later on validated by Tapia and Marsh II (2004). ATMI consists of 40-items under four subscales (*self-confidence*, *value*, *enjoyment*, and *mathematics*). In the questionnaire, all participants were required to choose the answer that reflected their feelings in accordance with the Likert-format scale of five points, from '1 = strongly disagree' through '3 = neutral' to '5 = strongly agree'. Since the ATMI had to be administered in the context of Pakistan for the first time, it was essential to establish the content validity of the questionnaire. For this purpose, the tool was sent to eight experienced mathematics practitioners for content validation. They suggested minor modifications in some items. Similarly, reliability of the questionnaire was established. Prior to establishing reliability, all negatively worded items were reverse coded in order to calculate the alpha coefficient by employing the reliability scale method as described by Field (2005). The reliability coefficient of the adapted instrument was found to be (α =0.94). In addition, the questionnaire was also translated into Urdu (the National Language of Pakistan) to make it more user-friendly particularly for government school students where the medium of instruction is Urdu.

Procedure

The ATMI was administered directly to research participants in their classrooms in an examination set-up. This technique entails that the researcher is present at the site when the questionnaire is being filled by the group of research participants (Gorard, 2003). Direct administration helped to get a higher response rate as compared to other methods (Frankel & Wallen, 2006). Directions for filling in the questionnaires were provided uniformly to all students to minimize bias. Students were informed about their right to withdraw from the research study (Annexure A).

Data Analysis

Data were analysed through Statistical Package for Social Sciences (SPSS) version 16 software. Based on the non-normality of the data, data were analysed using the non-parametric equivalent of the independent *t*-test.

Results

The unit of analysis for this study was students. Hence, sampling was carried out according to school type. The following section provides brief demographic information of the research participants that include type of school and age.

Type of School

The research participants of this study represent two types of schools: government (n = 06; 50%) and private (n = 06; 50%). The sample was stratified to represent both government and private schools. All schools in the sample were single-sex ones. Among the selected schools 42% (n = 05) were English medium schools while 58% (n = 07) were Urdu medium schools.

Research Participants' Age

The mean age of the students who participated in the study for the whole sample was 14.32 years (SD = 1.14). However, students from private secondary schools were slightly younger (M = 14.13 years, SD = 0.92) than students from government secondary schools (M = 14.54 years; SD = 1.32). This difference was also found to be statistically significant [Mann-Whitney U = 15067; $p < 0.001$].

Comparison between Types of Schools (government and private)

Table 1 presents the mean scores and the standard deviations of government and private school students' attitudes towards mathematics on ATMI.

Table 1: Mean Scores and Standard Deviations of Government and Private School Students' Attitudes towards Mathematics

Types of schools	N	Attitude towards Mathematics	
		Mean	SD
Government	186	3.96	0.70
Private	201	4.00	0.57
Total	**387**	**3.98**	**0.64**

With respect to scores of students on ATMI Table 1 indicates that the overall mean score for both government and private secondary schools students is 3.98 with a standard deviation of 0.64. This shows that students, irrespective of government

and private schools, hold positive attitudes towards mathematics at the secondary level.

An examination of Table 1 also reveals that, on average, students from private schools reported to have slightly more positive (M = 4.00; SD = 0.57) attitudes towards mathematics as compared to students from government schools (M = 3.96; SD = 0.70). This difference was not found to be statistically significant [Mann-Whitney U = 18654.00; p > 0.05].

Analysis at Subscale Level

In order to detect significant differences between students of government and private schools, Table 2 presents the mean scores and the standard deviations of students on ATMI at the subscale level.

Self-confidence in Mathematics

An examination of Table 2 reveals that, on average, students from private schools reported to have scored slightly higher (M = 3.84; SD = 0.76) as compared to students from government schools (M = 3.72; SD = 0.90) on the subscale 'self-confidence' in learning mathematics. This difference was not found to be statistically significant [Mann-Whitney U = 17662.00; p > 0.05].

Value of Mathematics

As presented earlier in Table 2 the results depict that, on average, students from government schools scored slightly higher (M = 4.39; SD = 0.60) as compared to students from private schools (M = 4.34; SD = 0.44) on the subscale 'value' of mathematics. This difference was also found to be statistically significant [U =15828.50; p < 0.01] with a small effect size[1] (r=1.13).

Enjoyment of Mathematics

Table 2 reveals that, on average, students from government schools scored a slightly higher (M = 3.97; SD = 0.84) than students from private schools (M = 3.96; SD = 0.72) on the subscale 'enjoyment' of mathematics. This difference was not found to be statistically significant [U = 17741; p > 0.05].

Table 2: Mean Scores and Standard Deviations of Government and Private Students at Subscale Level

Types of schools	N	Self-confidence		Value		Enjoyment		Motivation	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Government	186	3.72	0.90	4.39	0.60	3.97	0.84	3.84	0.94
Private	201	3.84	0.76	4.34	0.44	3.96	0.72	3.81	0.77
Total	**387**	**3.78**	**0.83**	**4.36**	**0.52**	**3.97**	**0.78**	**3.83**	**0.86**

Motivation

As shown in Table 2 the results reveal that, on average, students from the government schools scored slightly higher (M = 3.84; SD = 0.94) as compared to students from the private schools (M = 3.81; SD = 0.77) on the subscale 'motivation' for learning mathematics. However, this difference was not found to be statistically significant [Mann-Whitney U = 17353.00; $p > 0.05$].

Discussion

The results of the study demonstrate that students from the private schools claim to have a slightly more positive attitude towards mathematics than students from the government schools but the difference was not found to be statistically significant. This result is in contrast to the study of Miller and Moore (1991) who found that private school students showed significantly high positive attitudes towards mathematics as compared to government school students in USA. Moreover, this result is also not in line with the study of Khatoon and Mahmood (2010) who found that government school students showed high mathematics anxiety as compared to private school students in India. Interestingly, Utsumi and Mendes (2000) found that students from government schools showed significantly high positive attitudes towards mathematics as compared to students from private schools in Brazil.

Several studies (Alderman et al., 2001; Arif & Saqib, 2003; Aslam, 2009; Das et al., 2006) that have been conducted in Pakistan to compare students' learning differences in two types of schools (government and private) found that private school students significantly outperformed their government school counterparts in mathematics. It is to be noted that none of these studies specifically investigated the affective aspect of students in both government and private schools. These studies largely investigated the cognitive aspect of students in which students of private schools scored significantly higher than students of government schools. Comparing students' attitudes towards mathematics at the secondary level in both the government and private schools is an under-researched area in Pakistan.

Nevertheless, this insignificance of the result between government and private secondary school students' attitudes towards mathematics is understandable given that in both government and private schools most attention has been paid to course completion and securing high marks in the exams. Tapia and Marsh (2000) also concluded that schools pay insufficient attention to the attitudes of students towards mathematics, that mathematics is a worthwhile and necessary subject for everyone and that it has an important application in everyday life. Instead schools pay more attention to students' performance and test scores in mathematics. Teachers as well as schools tend to equate effective teaching with examination performance and as a result, teachers devote much of their time to teaching 'test-taking' strategies (Greaney & Hasan, 1998). Consequently, students do not see any link of mathematics outside the school and they study mathematics for the sake of securing high marks in the examination.

Another explanation of this insignificance of the result may be attributed to the medium of instruction which is largely English in a majority of private schools. Students are generally not proficient in English. Halai (2007) states that students in private schools usually go through two levels for interpretation of the statement of the problem tasks assigned to them by their teachers. First, students in the classroom try to understand the language involved in the tasks. Second, students also try to understand the mathematics involved in the tasks. As a result, they usually face the issue of comprehension of instructions and statement of the problem tasks in mathematics. This language issue becomes worse for students who have some kind of reading comprehension and phonological problems. In this case, students' processing of instruction and comprehension of the statement is done in languages other than English. Consequently, the comprehension of the statement of the problem tasks and instructions of the teachers sometimes effect students' confidence, motivation, value and enjoyment of mathematics.

In the light of the above discussion, it is said that this study did not find any significant difference between government and private school students' attitudes towards mathematics despite using an innovative measurement tool. However, more government school students as opposed to private

ones viewed mathematics as an important, necessary and worthwhile subject to study. One of the reasons for this significant result could obviously be attributed to the medium of instruction which is Urdu in government schools where students might find it easier to understand the statement of the problem tasks in Urdu as compared to private school students who study mathematics in English. A limitation of this small-scale study is that it did not look at the classroom practices which could have provided rich information of learning processes.

Conclusion

This small-scale study investigated the influence of school type on students' attitudes towards mathematics at the secondary level in Quetta, Pakistan. The study provides ample evidence that there were no significant differences between government and private school students' attitudes towards mathematics. Despite the fact that students in private schools have better learning opportunities, they showed similar attitudes towards mathematics as compared to their counterparts in government schools. Furthermore, the study also found no significant differences between government and private school students' attitudes towards mathematics at the subscale level except for 'value of mathematics', where government school students showed significantly more positive attitudes towards value of mathematics than private school students. Despite the use of an innovative and well-established attitudes inventory, there were no strong and clear differences regarding the attitudes of government and private school students towards mathematics. On the one hand, the results might seem disappointing. On the other hand, it might be considered interesting that the differences between the attitudes of government and private school students towards mathematics are negligible.

Recommendations

In light of the results of the study, some recommendations have been put forward for policy and practice.

- The results of the study suggest that teachers in both government and private schools must re-examine traditional teaching strategies such as chalk-and-talk method that mostly do not match the learning styles of the students. Teachers need to use a variety of innovative teaching strategies such as cooperative learning while delivering their lessons. Several research studies (e.g. Zakaria, Chin & Daud, 2010; Ifamuyiwa & Akinsola, 2008) found cooperative learning strategies useful in increasing students' attitudes towards mathematics. In this regard, mathematics teachers must be provided opportunities to develop their pedagogical skills through workshops and seminars.
- The heart of teaching lies in interaction and discussion with students. In the light of the results of the study, it is suggested that teachers must appreciate and encourage interactions and discussions in the classroom so that students can express and justify themselves. In this way, they can get confidence which would definitely improve their attitudes towards mathematics. Teachers must create such a platform for interactions for students with the aim that useful learning will take place in the classroom.
- There is widespread consensus among educationists and researchers that a student's positive attitude is an important factor in his/her success and future participation in mathematics. Hence, there is a need to understand more about how attitudes are shaped and altered in order to avoid unnecessary failure in mathematics. If students' attitudes can be changed, significant improvements in performance may be expected. For this purpose, teachers need to measure students' attitudes towards mathematics at the beginning of the year. In case it is revealed that some students have negative attitudes towards the discipline at least the teacher should know about their attitudes so that s/he can develop strategies which could alter students' attitudes towards mathematics.

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Annexure A

ATMI Instrument

The ATMI consists of 40 items designed to measure students' attitudes towards mathematics (Tapia, 1996; Marsh & Tapia, 2004). The instrument contains four subscales i.e. *self-confidence*, *value of mathematics*, *enjoyment of mathematics*, and *motivation*. The items were developed using a Likert-format scale of five alternatives for the responses with anchors from 'strongly disagree' to 'strongly agree'. Furthermore, there are 11 negatively worded items. The overall reliability of the instrument is 0.97. Table 1 describes each subscale and gives sample items.

Description of Subscales and Sample Items

Scale Name	**No. of Items**	**Sample Item**
Self-confidence	15	• I have a lot of self-confidence when it comes to mathematics. • Studying mathematics makes me feel nervous.
Value of mathematics	10	• Mathematics is a very useful and necessary subject. • Mathematics is important in everyday life.
Enjoyment	10	• I like to solve new problems in mathematics. • I really like mathematics.
Motivation **4 scales**	05 **40 Items**	• The challenge of mathematics appeals to me. • I am willing to take more than the required amount of mathematics.